United States Department
of Agriculture

Ladder Watershed

Hydrologic Unit Code 10260004

Natural Resources
Conservation Service

Rapid Assessment

Lakewood, Colorado

RWA 10260004

November 2008

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Introduction

Background Information

The Natural Resources Conservation Service (NRCS) is encouraging the development of rapid watershed assessments in order to increase the speed and efficiency generating information to guide conservation implementation, as well as the speed and efficiency of putting it into the hands of local decision makers.

Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help land-owners and local leaders set priorities and determine the best actions to achieve their goals.

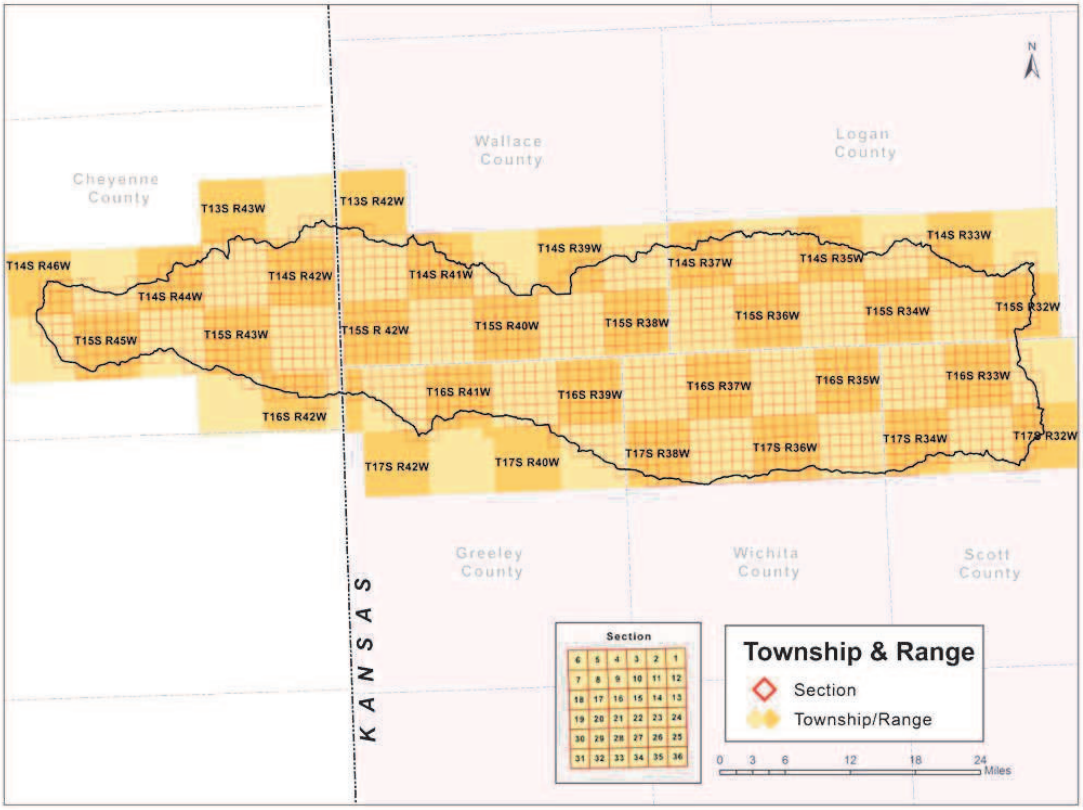
Benefits of these Activities

While rapid assessments provide less detail and analysis than full-blown studies and plans, they do provide the benefits of NRCS locally-led planning in less time and at a reduced cost. The benefits include:

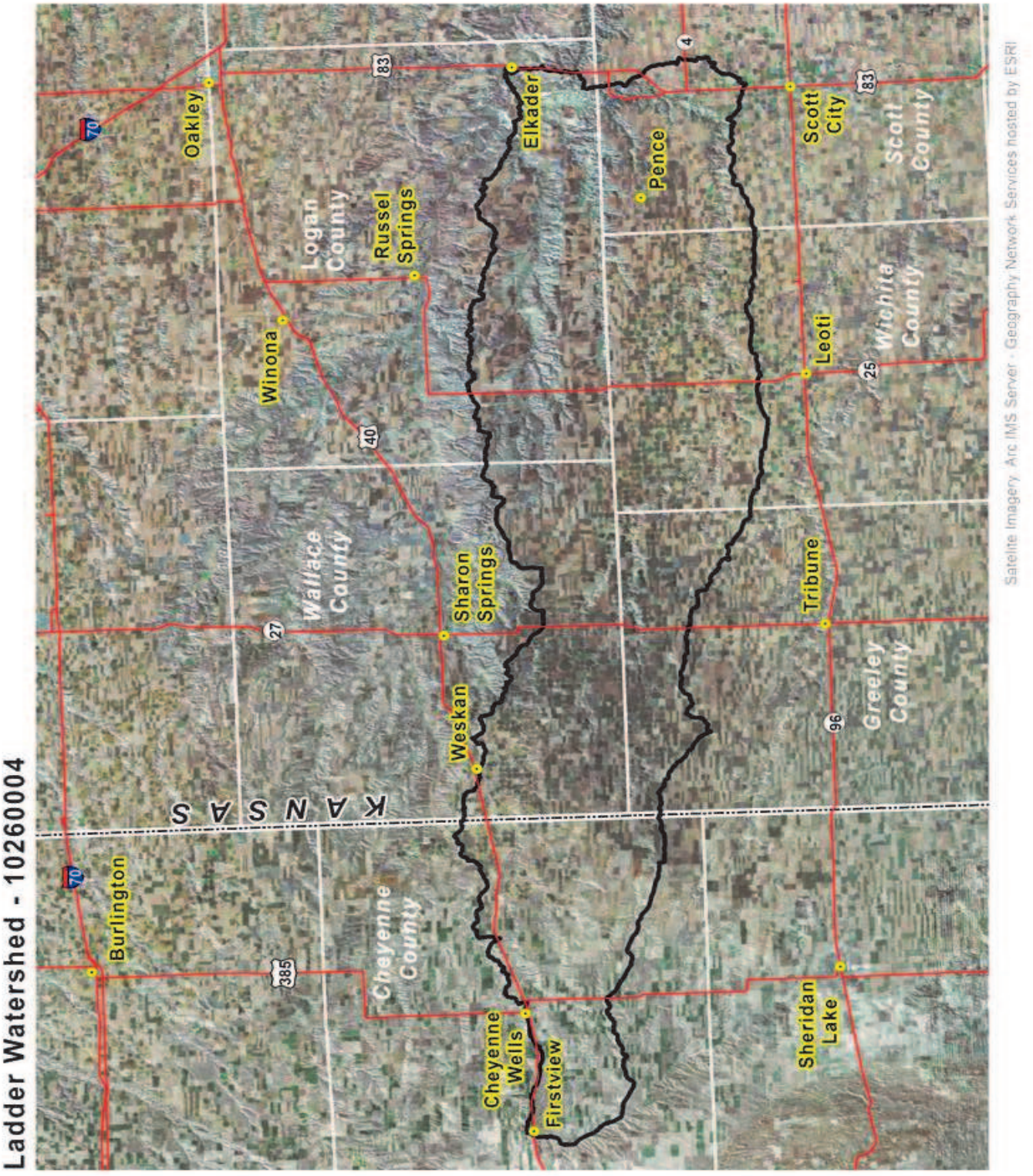
- Quick and inexpensive tools for setting priorities and taking action
- Providing a level of detail that is sufficient for identifying actions that can be taken with no further watershed-level studies or analyses
- Actions to be taken may require further Federal or State permits or ESA or NEPA analysis but these activities are part of standard requirements for use of best management practices (BMPs) and conservation systems
- Identifying where further detailed analyses or watershed studies are needed
- Plans address multiple objectives and concerns of landowners and communities
- Plans are based on established partnerships at the local and state levels
- Plans enable landowners and communities to decide on the best mix of NRCS programs that will meet their goals
- Plans include the full array of conservation program tools (i.e. cost-share practices, easements, technical assistance)

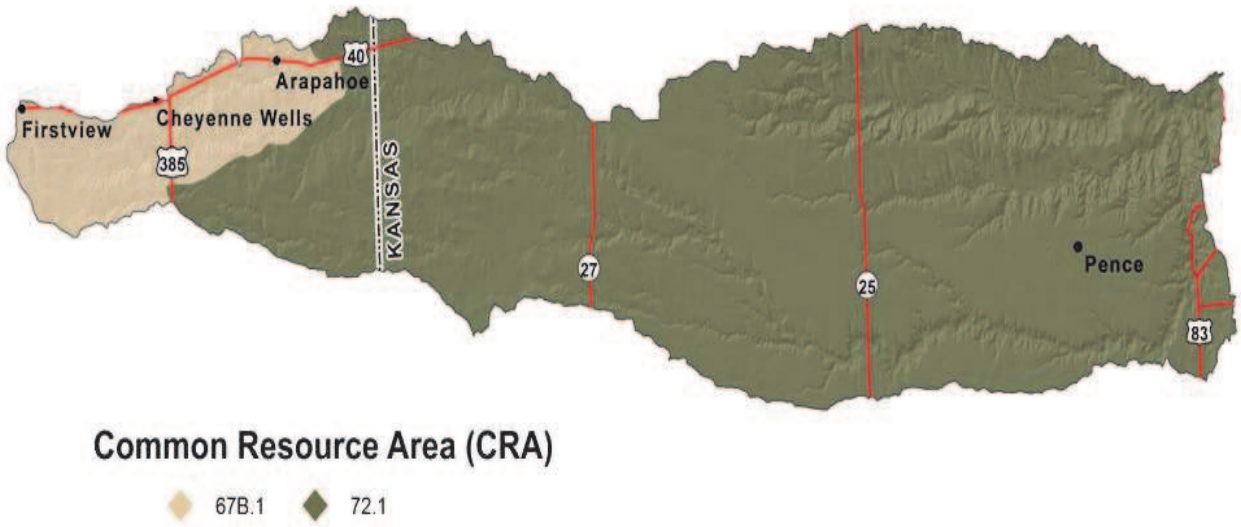
Rapid Watershed Assessments provide information that helps land-owners and local leaders set conservation priorities.

The Ladder Watershed is located in the Republican River Basin, on the eastern plains of Colorado. The watershed is 908,178 acres in size, with 174,322 acres in Colorado. Approximately 486 farms and ranches cover 803,369 acres in the entire watershed. As of April 2005, there are 77,987 acres of land in the Conservation Reserve Program.



COLORADO County	County Acres	County Acres in LADDER Watershed	% of County in the Watershed	% of Watershed in the County
Cheyenne	1,140,382	174,322	15.3%	19.2%
KANSAS				
Greeley	498,469	93,656	18.8%	10.3%
Logan	688,123	191,261	27.8%	21.1%
Scott	460,360	94,655	20.6%	10.4%
Wallace	585,647	180,305	30.8%	19.9%
Wichita	460,642	173,979	37.8%	19.2%
		908,178		


Ladder Watershed - 10260004
KANSAS
Burlington
Oakley
Winona
Logan County
Russel Springs
Elkader
Pence
Scott City
Scott County
Wallace County
Sharon Springs
Weskan
Tribune
Leoti
Wichita County
Greeley County
Cheyenne County
Cheyenne Wells
Firstview
Sheridan Lake
70
83
40
27
385
96
25
4
Satellite Imagery - Arc IMS Server - Geography Network Services hosted by ESRI



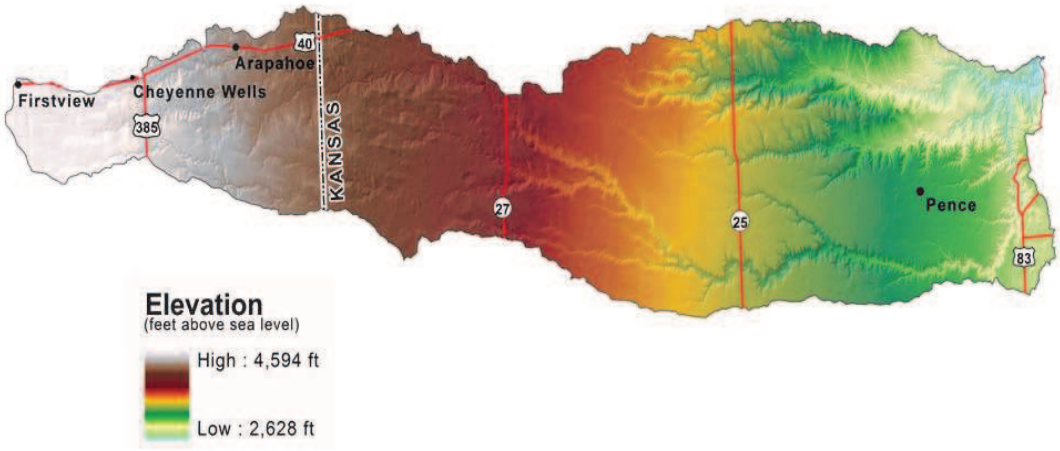
CRA: A geographical area where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.

MLRA	CRA	CRA NAME	CRA DESCRIPTION
67B	**67B.1**	Central Great Plains, Southern Part	The Central High Plains, Southern Part CRA is broad, undulating to rolling plains dissected by streams and rivers. Local relief is measured in tens of feet on the plains. Soils are deep and formed in aeolian and alluvial materials. Pre-settlement vegetation was short grass prairies. Nearly all of this area in fallow cropland rotations or rangeland. Some cropland areas are irrigated.
72	**72.1**	Central High Tableland	The Central High Tableland CRA is broad, level to gently rolling, loess mantled tableland. Local relief is measured in feet on the tableland tens of feet and major river valleys bordered by steep slopes. Soils are deep. Pre-settlement vegetation was short grass prairies. Nearly all of this area in cropland, both dry land small grain crops and irrigated corn and grain sorghum.

Physical Description

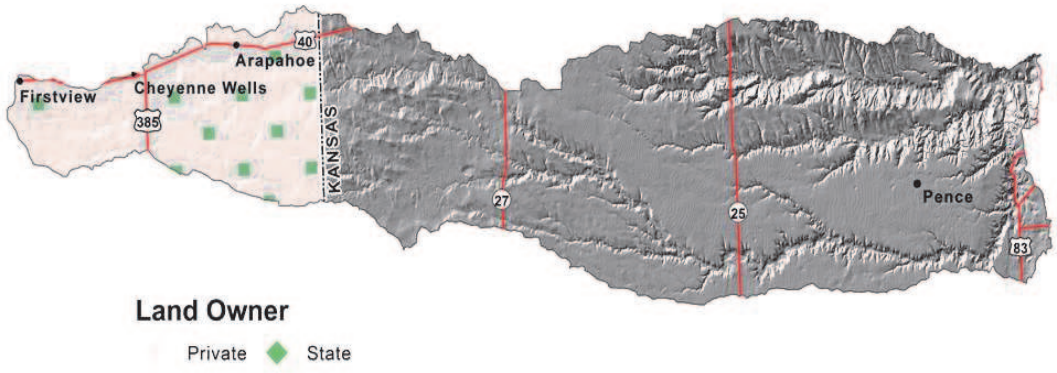
The Ladder watershed consists of broad, inter-valley remnants of smooth plain, with gently rolling slopes, punctuated by steeper slopes along the drainages.

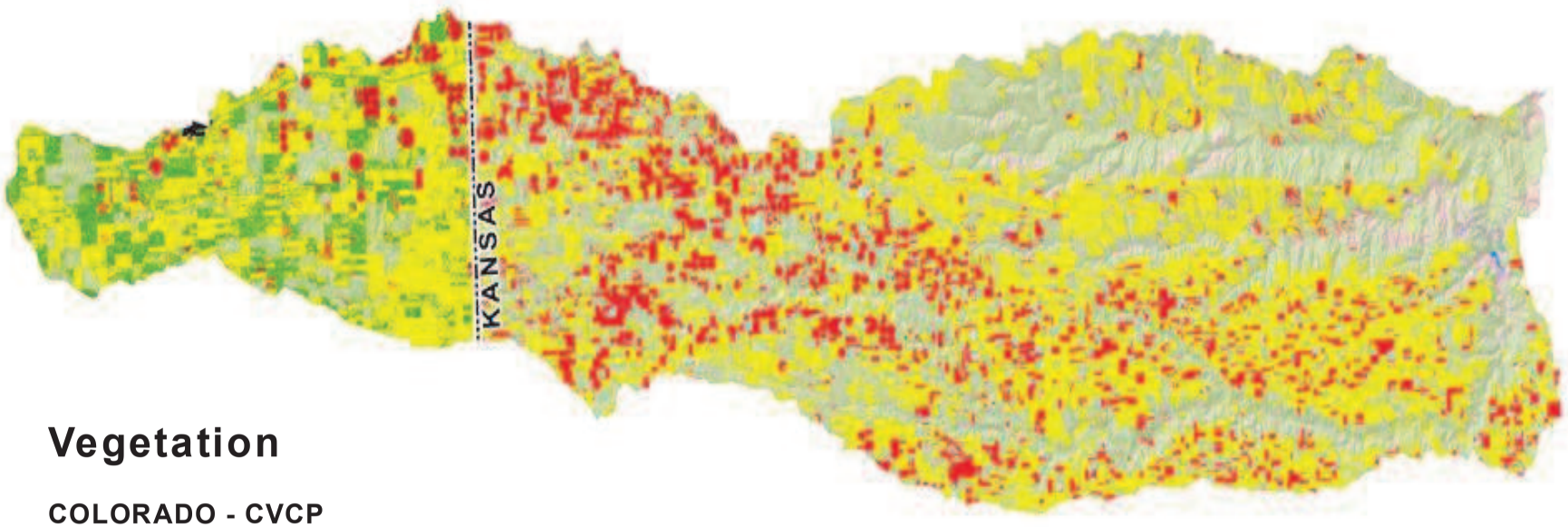
The predominant land use is agriculture, consisting of cash grain farming and livestock production. Cropland is dominated by dryland winter wheat rotations, and corn and grain sorghum production in areas where irrigation is available. Steeper slopes are generally in native grasses and used for livestock grazing.



Land Ownership

Approximately 167,819 acres in the Colorado portion of the Ladder Watershed are privately owned, and 6,440 acres are state controlled land.





Vegetation

COLORADO - CVCP

- Dryland Ag
- Grass Dominated
- Grass/Forb Mix
- Herbaceous Riparian
- Irrigated Ag
- Riparian
- Sagebrush/Grass Mix
- Short-grass Prairie
- Soil
- Urban/Built Up

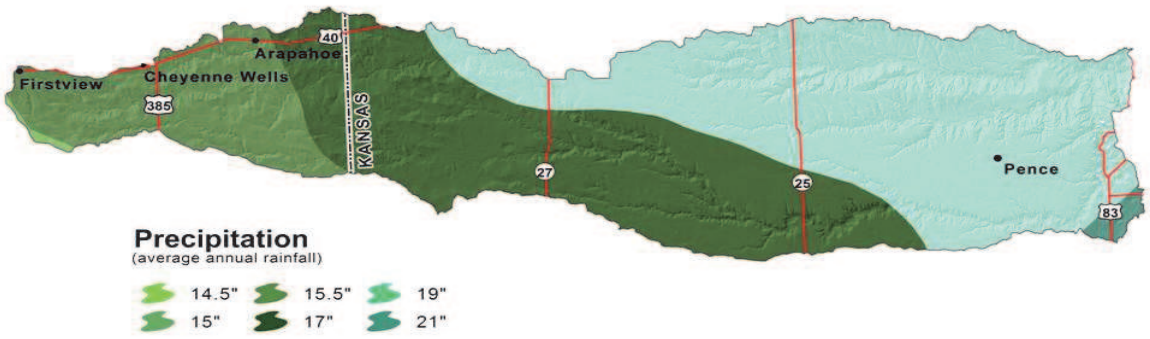
KANSAS - NLCD

- Water
- Low Intensity Residential
- High Intensity Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrubland
- Grassland/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Emergent Herbaceous Wetland

LADDER Colorado Land Use	Total Acreage	Vegetation	Acreage
Cropland	99,365	Irrigated Ag	11,688.6
		Dryland Ag	87,676.7
Rangeland/Grassland	73,204	Grass Dominated	38,854.3
		Grass/Forb Mix	9,215.9
		Sagebrush/Grass Mix	67.9
		Short-grass Prairie	25,066.2
Riparian	872	Herbaceous Riparian	701.1
		Riparian	171.3
Other	508	Soil	35.0218
		Urban/Built Up	472.7513
Total Colorado Watershed Acres			**173,950**

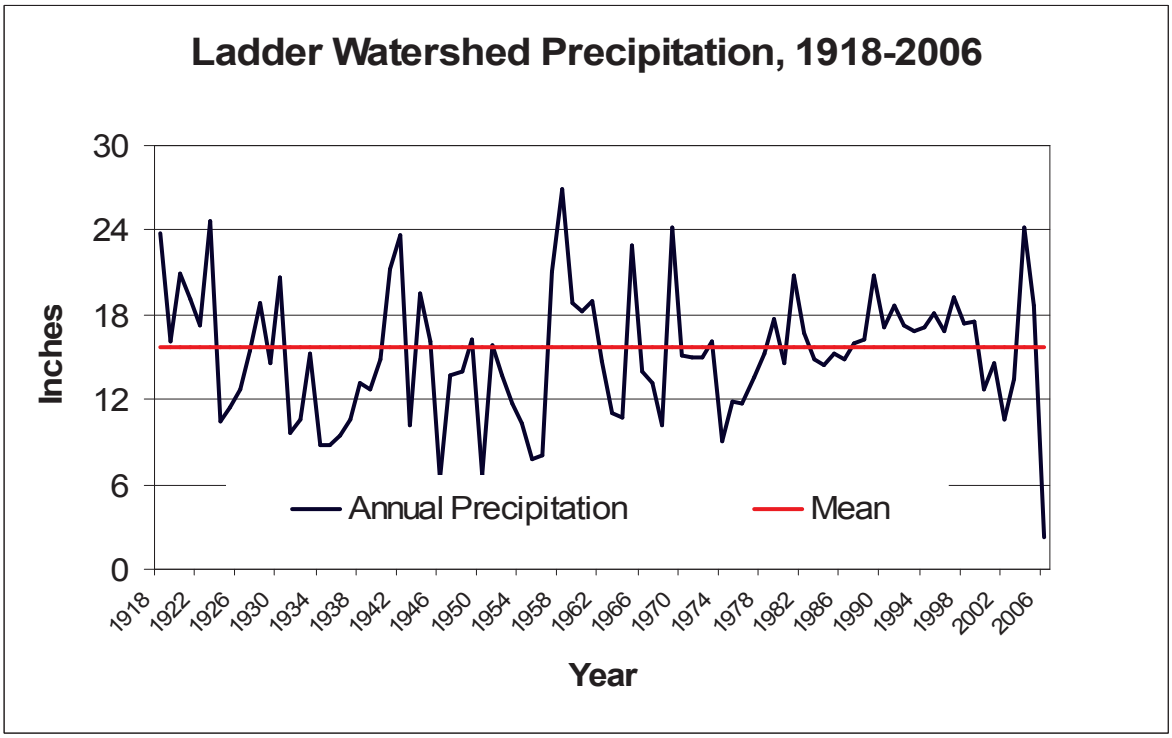
LADDER Kansas Land Use	Total Acreage	Vegetation	Acreage
Cropland	361,861	Pasture/Hay	21,423.4
		Row Crops	91,194.4
		Small Grains	249,243.0
Rangeland/Grassland	370,941	Shrubland	9,584.1
		Grasslands/Herbaceous	361,356.9
Forest	608	Deciduous Forest	33.7
		Evergreen Forest	573.3
		Mixed Forest	0.7
Riparian	9	Emergent Herbaceous Wetlands	9.0
Water	164	Water	164.2
Other	245	Low Intensity Residential	25.8
		High Entensity Residential	1.1
		Commercial/Industrial/Transportation	57.6
		Bare Rock/Sand/Clay	160.2
Total Kansas Watershed Acres			**733,827**

Precipitation



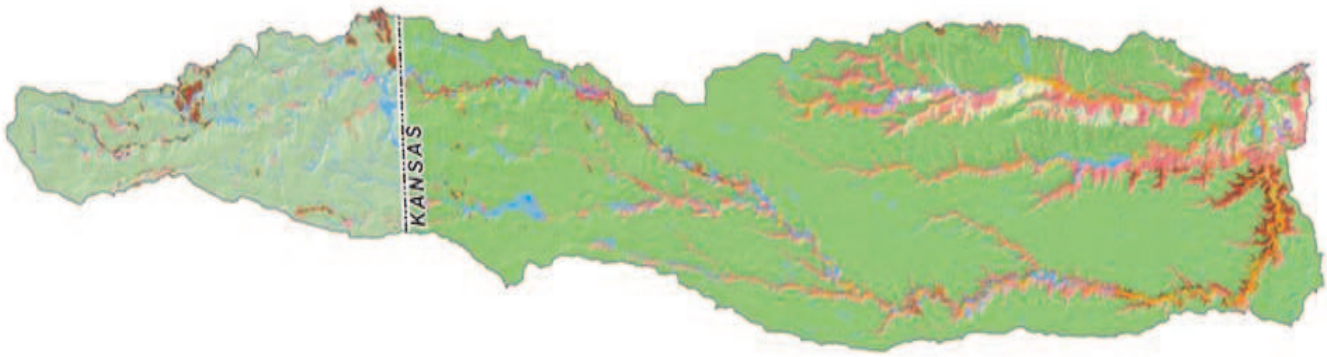
Precipitation in the Ladder watershed averages between 15 and 17 inches per year. Droughts are common in the watershed, as with the rest of Colorado. Statewide, in the 1900's alone, four prolonged dry spells occurred. The first took place in the 1910s, and another, in the '30s, caused the dust-bowl period. The second worst drought on record in the state occurred in the mid-50s, when a series of hot, dry summers following a period of scant mountain snowpack created water shortages. The fourth serious drought hit parts of Colorado in the late 1970s, and the most severe drought of the century occurred in 2002. Climatic records have been kept in Colorado since the late 1800s, and researchers look to tree ring data for clues to climatic conditions prior to the record. Tree ring data indicates historic occasions of acute drought in Colorado, with some lasting many years.

Rainfall in the watershed typically occurs as frontal storms in the early summer, and as high intensity, convective thunderstorms in late summer. Maximum precipitation is from mid spring through late autumn, and precipitation in winter is snow. The average annual temperature is from 37 to 66 degrees F. The frost free period averages 153 days but ranges from 106 to 184 days.



Ecological Sites – The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

Ecological Site maps give an overall indication of the soils plant relationship in the area. More detailed descriptions of ecological sites are provided in the Field Office Technical Guide (FOTG). The FOTG is available in local offices of the Natural Resources Conservation Service (NRCS) and online at http://www.nrcs.usda.gov/technical/efotg/.

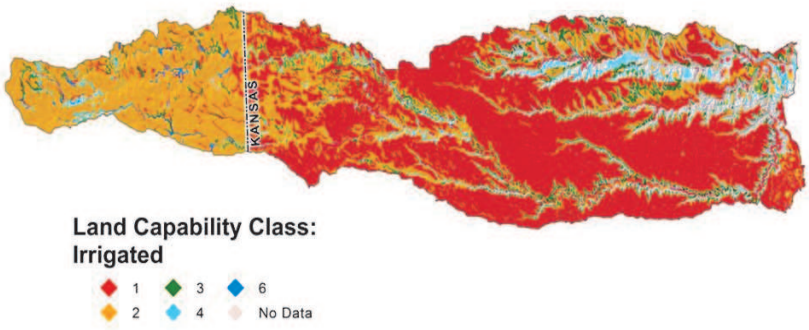


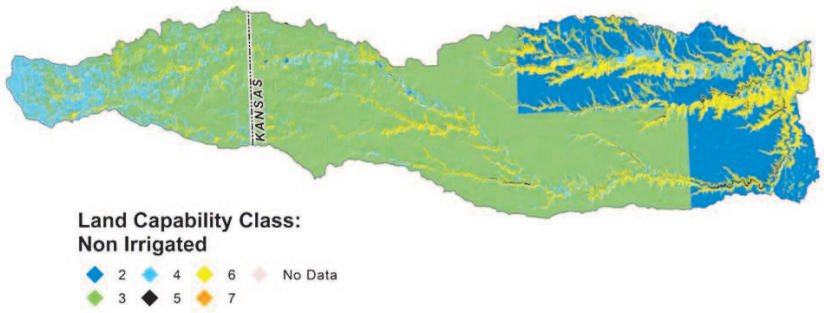
Soil: Ecological Site Name

- No Data
- Chalk Flats
- Clay Upland
- Closed Upland Depression (Plains Swale in CO)
- Clayey
- Gravelly Hills
- Gravel Breaks
- Loamy Lowland
- Loamy Terrace (Part of Overflow, CO)
- Loamy Terrace
- Loamy Upland (Loamy Plains, CO)
- Limy Upland (Loamy Slopes, CO)
- Loamy
- Loamy Slopes
- Overflow
- Plains Swale
- Sands (Deep Sand, CO)
- Sandy (Sandy Plains, CO)
- Sandy Lowland (Sandy Bottomland, CO)
- Sandy Terrace (Sandy Bottomland, CO)
- Shale Breaks
- Shallow Limy (Limestone Breaks, CO)
- Saline Overflow
- Salt Flat
- Sands
- Sandy
- Sandy Bottomland

Land Capability Classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for wood land, and for engineering purposes.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.





Land Capability Classes

Class 1 - soils have few limitations that restrict their use.

Class 2 - soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 - soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 - soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 - soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 - soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

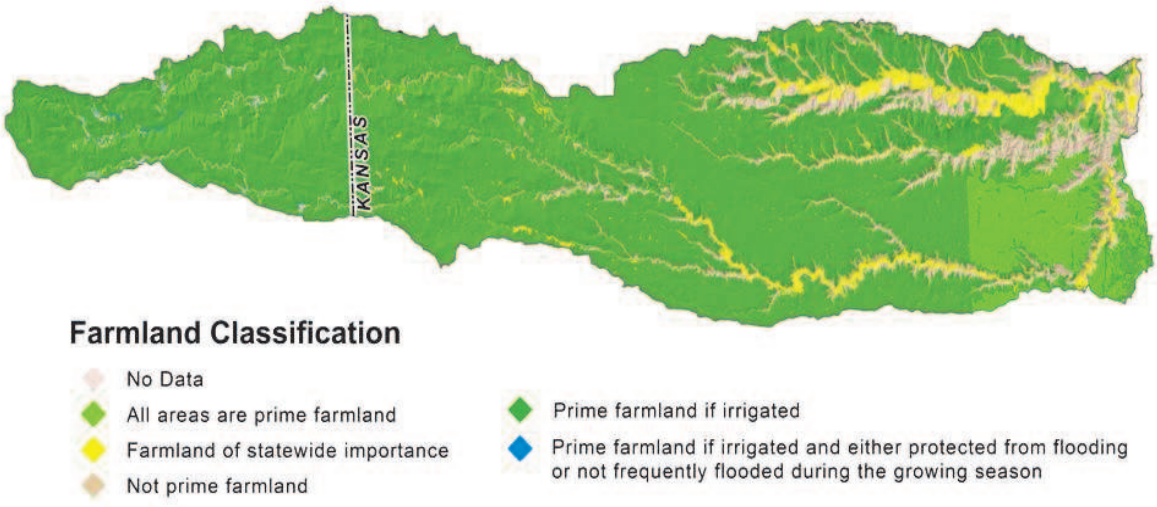
Class 7 - soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 - soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or aesthetic purposes.

Farmland Classification

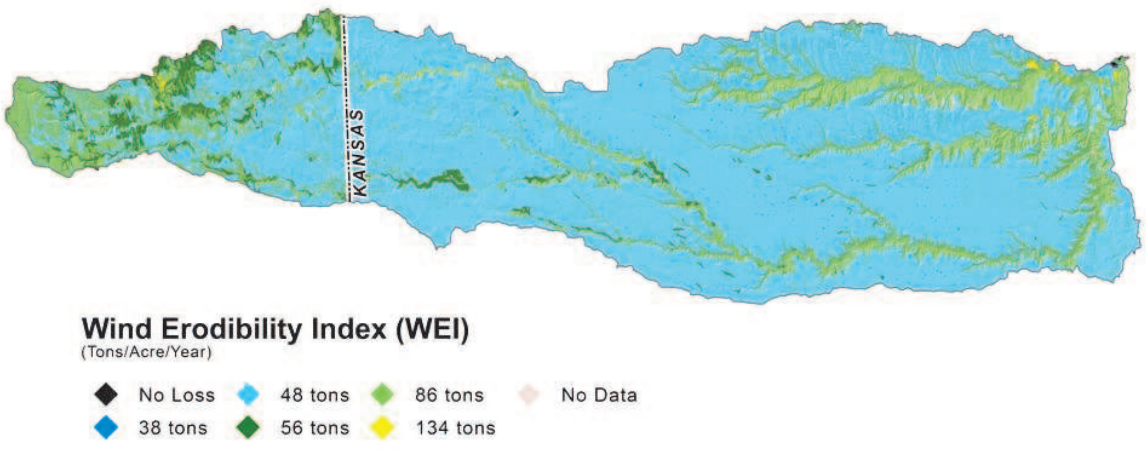
Prime farmland is land that has the best combination of physical characteristics for producing food, feed, forage, fiber and oil seed crops and is also available for these.

Colorado had approximately 1,696,800 acres of nonfederal prime farmland recorded in 1997. This represents over 2 percent of the states total land area or 4 percent of the nonfederal land in Colorado. Nationally. 64 percent of soils classified as prime farmland are being used for cropland. In Colorado, 93 percent of the soils classified as prime farmland are being utilized as cropland.



Wind Erodibility Index

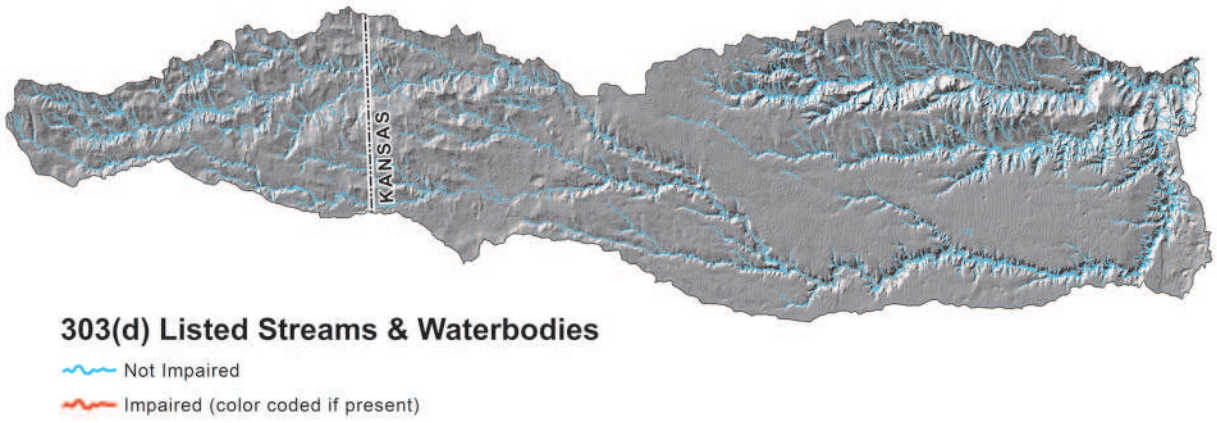
The Wind Erodibility Index (WEI), is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion if it is assumed there is no vegetative cover or management. Soils with an erodibility index equal to or greater than 8 are considered highly erodible.



Surface Water Quality

Surface water quality in the Ladder Watershed is generally good. Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met for designated uses. As indicated in the map, there are no 303(d) listed streams in the watershed. The Smoky Hill Headwaters are designated as Primary Contact Recreation, Aquatic Life Warm I, and Agriculture.

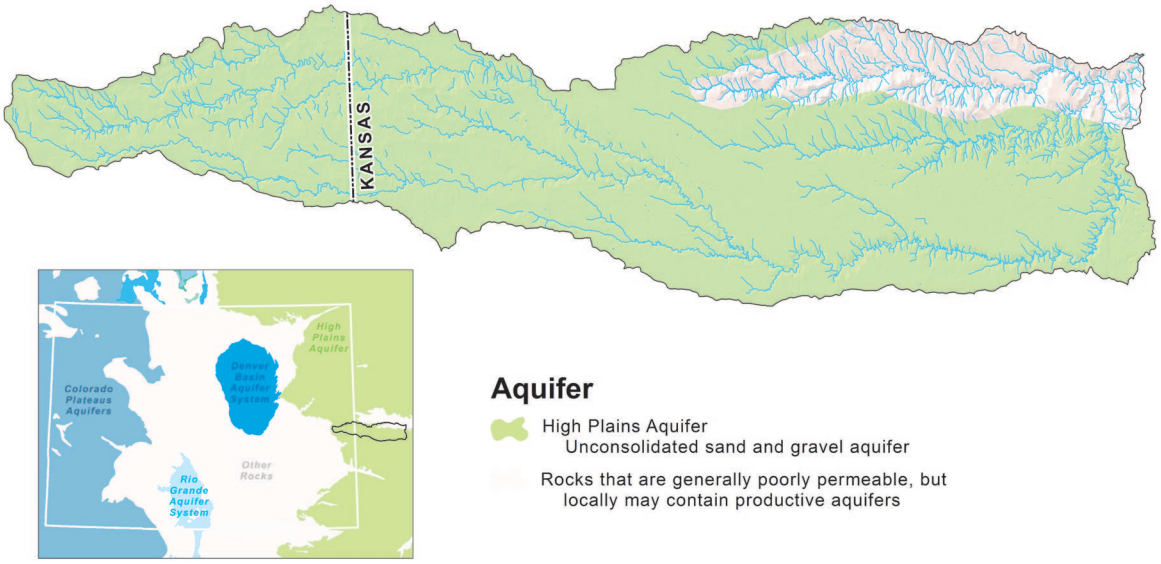
Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met. Thereafter, TMDLs compromising quantitative objectives and strategies have been or will be developed for these impaired waters within the watershed in order to achieve their water quality standards. Updates to the 303d/TMDL list can be found at: http://www.cdphe.state.co.us/op/wqcc/SpecialTopics/303(d)/303dtmdlpro.html



Ground Water

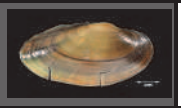
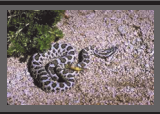
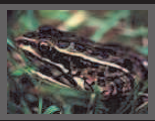
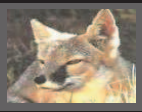
The High Plains Aquifer underlies the Ladder watershed, and is the primary source of irrigation and domestic water for the area. The High Plains aquifer is an extensive regional aquifer that underlies the Great Plains states extending from South Dakota on the north to Texas and New Mexico on the south.

Ground water quality is generally good. Total dissolved solids in the aquifer have risen significantly since the early 1900s, and in some areas, the water may exceed drinking water standards for sulfate, chloride, fluoride, iron and arsenic. These concentrations may be naturally derived from geologic sources.



Threatened & Endangered Species

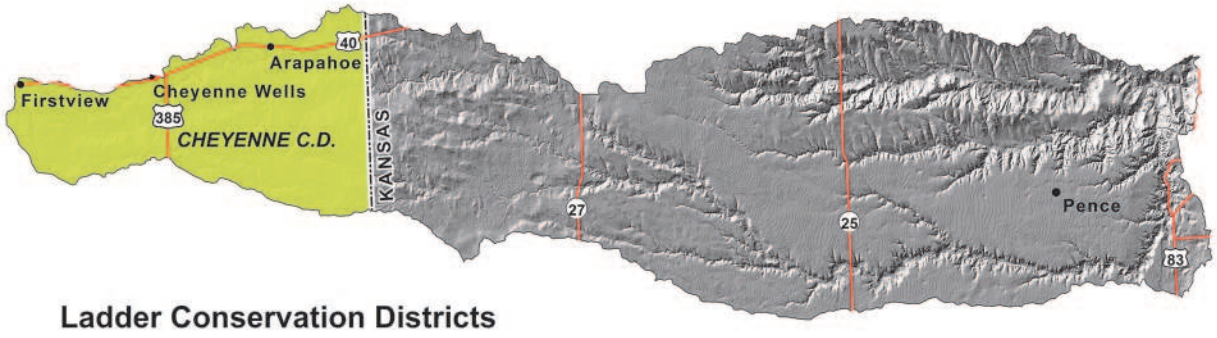
State & Federally Threatened, Endangered & Candidate Species as well as Species of Special Concern in Ladder Watershed

	Common Name	Scientific Name	Class	Federal Status	State Status	Comments
	**Bald Eagle**	*Haliaeetus leucocephalus*	Birds	None	Threatened	May migrate through watershed
	**Black-footed Ferret**	*Mustela nigripes*	Mammals	Endangered	Endangered	No current records of occurrence
	**Black-tailed Prairie Dog**	*Cynomys ludovicianus*	Mammals	None	Concern	Occurs in the watershed
	**Burrowing Owl**	*Athene cunicularia*	Birds	None	Threatened	Occurs in the watershed
	**Cylindrical papershell**	*Anodontoides ferussacianus*	Gastropods	None	Concern	May occur in the watershed
	**Ferruginous Hawk**	*Buteo regalis*	Birds	None	Concern	Occurs in the watershed
	**Long-Billed Curlew**	*Numenius americanus*	Birds	None	Concern	May occur in the watershed
	**Massasauga**	*Sistrurus catenatus*	Reptiles	None	Concern	May occur in the watershed
	**Mountain Plover**	*Charadrius montanus*	Birds	None	Concern	May occur in the watershed
	**Northern leopard frog**	*Rana pipiens*	Amphibians	None	Concern	May occur in the watershed
	**Plains Leopard Frog**	*Rana blairi*	Amphibians	None	Concern	May occur in the watershed
	**Swift fox**	*Vulpes velox*	Mammals	None	Concern	Occurs in the watershed
	**Yellow mud turtle**	*Kinosternon flavescens*	Reptiles	None	Concern	May occur in the watershed

Short to mid-grass prairie is the dominant, non-cropland, terrestrial habitat type in this watershed. Grassland species such as swift fox and black-tailed prairie dog are representative of this habitat type. The Conservation Reserve Program also provides a significant acreage of grassland habitat in this watershed. Water is scarce and the native species in this watershed are those that can survive without abundant water supplies. Riparian areas, playa lakes, and stock ponds provide seasonal to intermittent aquatic habitats. Economically important wildlife species that occur in the watershed include pronghorn (antelope), mule and/or white-tailed deer, mourning dove, and pheasant.

Social Data

	Cheyenne	Logan
Demographics (US Census, American Factfinder)		
Total population	2,231	
Male	1,119	
Female	1,112	
Median age (years)	37.9	
White	2,072	
Black or African American	11	
American Indian and Alaska Native	17	
Asian	3	
Native Hawaiian and Other Pacific Islander	0	
Some other race	114	
Hispanic or Latino (of any race)	181	
Economic Characteristics (US Census, American Factfinder)		
In labor force (population 16 years and over)	1,066	
Median household income (dollars)	37,054	
Median family income (dollars)	44,394	
Per capita income (dollars)	17,850	
Families below poverty level	53	
Individuals below poverty level	244	
County Agricultural Characteristics (Colorado Agricultural Census, county data tables)		
Farms (number)	283	930
Land in farms/ranches (acres)	740,486	1,111,135
Average size farm/ranch (acres)	2,617	1,195
Median size farm (acres)	1,528	608
Average age of farmer or rancher	57.2	52.8
Net cash return from ag sales ($1,000)	1,829	5,092
Cattle and calves (number)	20,000	185,000



Ladder Conservation Districts

Resource Concerns Identified by Conservation Districts

Resource Concern By Priority	Cheyenne
Rangeland/Grazingland Health and Productivity	1
Sustainable Cropland	2
Water Resources	3
Trees	4
Invasive Weeds	5

Notes:

The Conservation Districts identified and prioritized these resource concerns during facilitated public meetings held between 1998 and 2000 and are part of the Conservation District's Long Range Plans.

Selected Conservation Application Data

	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Total
Total Conservation Systems Planned (Acres)	8,864	2,367	Not Avail.	3,968	6,267	6,062	27,528
Total Conservation Systems Applied (Acres)	8,733	5,279	Not Avail.	1,482	3,251	8,848	27,593
Practices							
Prescribed Grazing	0	0	0	0	0	1,179	1,179
Upland Wildlife Habitat Management	665	0	296	814	7	1,857	3,639
Conservation Cropping System	0	0	0	0	321	2,905	3,226
Residue Management	0	0	0	107	480	3,645	4,232

Conservation Systems to Address Major Resource Concerns

Primary Resource Concern:	**Rangeland Health**			
Conservation System Description:	Prescribed Grazing—planned management that provides adequate recovery opportunity between grazing events and proper stocking of animals. Estimate 72,000 acres need to be treated on medium sized ranches of 3,500 acres.			**Based on Conservation System Guide Code:** CO 67B.1-GR-01-R-Grazing
Practices	**Unit**	**Quantity**	**Cost/Unit ($)**	**Estimated Cost ($)**
Prescribed Grazing:				
Fence (382)	Ft.	22,000	0.6	13,200
Pest Management (595)	Ac.	500	5.0	2,500
Pipeline (516)	Ft.	10,000	2.40	24,000
Upland Wildlife Habitat Management (645)	Ac.	500	na	0
Watering Facility (614)	No.	4	410	1,640
Windbreak/Shelterbelt Establishment (380)	Ft.	3,000	.85	2,550
Costs to apply prescribed grazing per median sized ranch of 4,500 acres	No.	20	43,890	
Subtotal: Rangeland costs				**$877,800**

Conservation Systems to Address Major Resource Concerns (cont'd)

Primary Resource Concern:	**Soil Erosion By Wind on dryland crops**			
Conservation System Description:	Seasonal residue management with Conservation crop rotation, Nutrient and Pest Mgt			**Reference Conservation System Guide Code:** CO 67B.1-CR-Dryland-R-2
Practices	**Unit**	**Quantity**	**Cost/Unit ($)**	**Estimated Cost ($)**
Conservation Crop Rotation (328)	Ac	60,000	5	300,000
Residue Mgmt, Seasonal (344)	Ac	50,000	5	250,000
Nutrient Management (590)	Ac	20,000	5	100,000
Pest Management (595)	Ac	20,000	15	300,000
			Subtotal Costs Dryland Crops:	**$950,000**

General Effects, Impacts, and Estimated Costs of Application of Conservation Systems

Landuse	**Resource Concern**	**Measurable Effects**	**Non-measurable Effects**	**Estimated Cost ($)**
Rangeland	Plants		Improved plant condition, productivity, health and vigor. Grazing animals have adequate feed, forage, and shelter. Wildlife habitat is sustained or improved.	**$877,800**
Dryland Crop	Soil	225,000 Total Tons/Year saved	Cropland sustainability	**$950,000**
			Estimated Total Costs to Address Major Resource Concerns:	**$1,827,800**

References Not Cited in Document

303(d) listed streams within Big Sandy Watershed were created using data from Colorado Department of Public Health & Environments' Water Quality & Control Commission. Impaired streams are current as of April 30, 2006. For a list of all Colorado impaired streams, locations and priority ratings, visit http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegtmdls.pdf.

Threatened and Endangered Species information was gathered using data from the Colorado Division of Wildlife (CDOW) Natural Diversity Information Source (NDIS).

Resource Concerns were identified using the Colorado Association of Conservation Districts' (CACD) long range (10 year) plans from the period of 1996-2000. For more information on Colorado's Conservation Districts, visit http://www.cacd.us.

Maps were generated using Soil Survey Geographic Database (SSURGO) tabular and spatial data. SSURGO data was downloaded for the following Colorado and Kansas surveys:

Cheyenne County Area (CO017) Published 12/19/2005
Greeley County Area (KS071) Published 02/08/2006
Logan County Area (KS109) Published 12/20/2006
Scott County Area (KS171) Published 12/21/2006
Wallace County Area (KS199) Published 12/28/2006
Wichita County Area (KS203) Published 12/23/2006

Vegetation data was generated using the Colorado Division of Wildlife's "Colorado Vegetation Classification Project" (CVCP) data. visit http://ndis.nrel.colostate.edu/coveg.

Common Resource Area (CRA), a subdivision of the Major Land Resource Area (MLRA), is a geographical area where resource concerns, problems, or treatment needs are similar. For more information on Common Resource Areas visit http://soils.usda.gov/survey/geography/cra.html.

Average Annual Precipitation data was developed through a partnership between the Natural Resources Conservation Service's (NRCS) National Water and Climate Center (NWCC), the National Cartography and Geospatial Center (NCGC), and the PRISM (the Parameter-elevation Regressions on Independent Slopes Model) group at Oregon State University (OSU), developers of PRISM. Mean annual precipitation maps were developed calculating averages of rainfall for the period of 1961-1990. For more information visit http://www.ncgc.nrcs.usda.gov/products/datasets/climate/docs/fact-sheet.html or http://www.ocs.orst.edu/prism.

Land Ownership (status, 2004 dataset) data was obtained from the Colorado Department of Transportation (CDOT). For more information, visit http://www.dot.state.co.us.

Relief & Elevation maps were created using the National Elevation Dataset (NED), 30m Digital Elevation Model (DEM) raster product assembled by the U.S. Geological Survey (USGS). The data was downloaded from the NRCS Geospatial Data Gateway at http://datagateway.nrcs.usda.gov.

Conservation Systems to address major resource concerns were extracted from the Conservation Systems Guides (CSG) compiled from local conservationists by the NRCS Ecological Sciences Section at the Lakewood State Office.

Effects and Impacts of application of conservation systems were extracted from Colorado eFOTG, Section III, Resource Quality Criteria, NRCS, Colorado, March 2005.